Localizing significance of temporal intermittent rhythmic delta activity (TIRDA) in drug-resistant focal epilepsy

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Abstract

Objective: Temporal intermittent rhythmic delta activity (TIRDA) is an EEG pattern characterized by sinusoidal trains of activity, ranging from 1 to 3.5 Hz, and well localized over the temporal regions. It is considered to be an indicator of temporal lobe epilepsy (TLE), but full agreement between different authors has still not been reached. The aim of this study was therefore to assess the role of TIRDA in localizing the epileptogenic zone, which was estimated using anatomo-electro-clinical correlations obtained from non-invasive pre-surgical investigations, in a large group of patients affected by drug-resistant partial epilepsy.

Methods: The occurrence of TIRDA was investigated using a prolonged Video-EEG recording of 129 patients affected by drug-resistant partial epilepsy that underwent a non-invasive pre-surgical protocol. Patients were divided into 3 groups: TLE only, extratemporal epilepsy, and multilobar epilepsy including temporal lobe. According to the epileptogenic zone identified using anatomo-clinical-radiological correlations, 3 different subgroups of TLE were identified: mesial, lateral, and mesio-lateral. Statistical analysis was performed in order to evaluate the relationship between TIRDA and the epileptogenic zone, and neuroradiological, neuropathological, EEG interictal and ictal findings.

Results: The pattern of TIRDA was observed in 52 out of the 129 (40.3%) patients studied. Significant correlations were found between TIRDA and: (i) mesial and mesio-lateral TLE; (ii) mesial temporal sclerosis; (iii) interictal epileptiform discharge localized over the anterior temporal regions; and (iv) 5–9 Hz temporal ictal discharge.

Conclusions: Our research shows that TIRDA plays a role in localizing the epileptogenic zone, suggesting that this pattern might be considered as an EEG marker of an epileptogenesis that involves the mesial structures of the temporal lobe. However, further studies investigating the relationship between intracranial EEG monitoring and simultaneous scalp EEG recording are needed in order to confirm our findings and improve our understanding of the significance of TIRDA.

Keywords: Temporal intermittent rhythmic delta activity; Temporal lobe epilepsy; Pre-surgical evaluation; EEG; Epilepsy surgery